Condition Based Maintenance

Reliability Centered Maintenance

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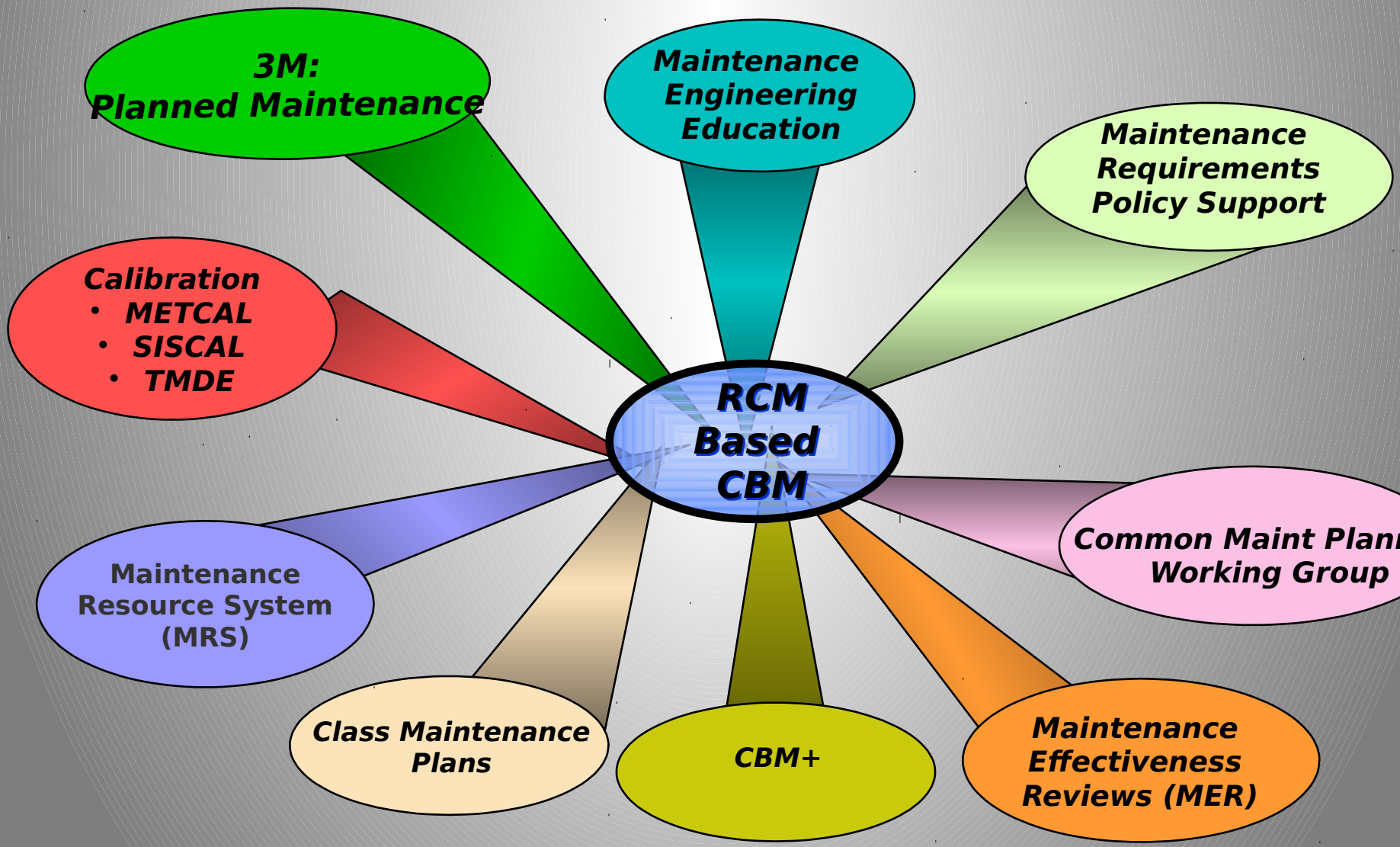
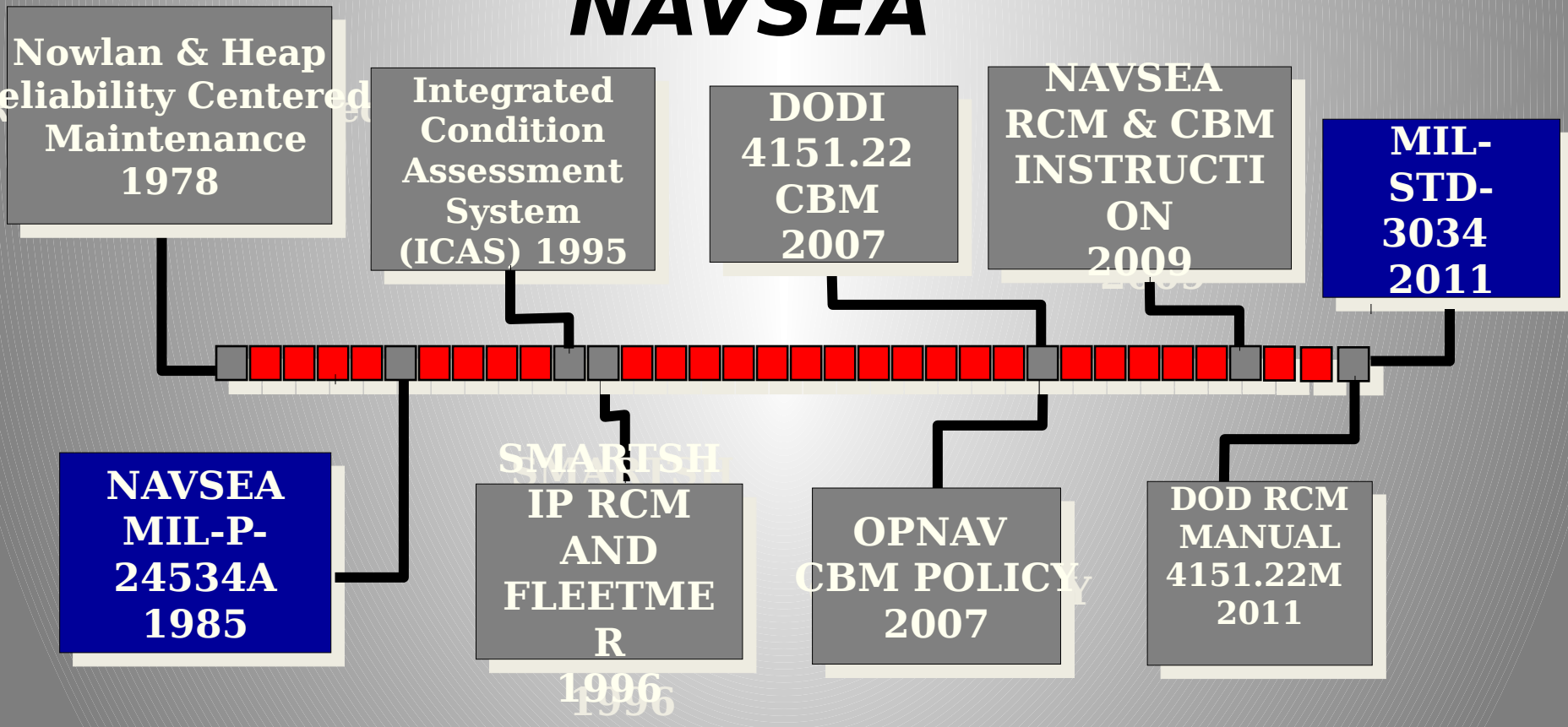
What Does NAVSEA 04RM Do?



High Visibility - High Return Programs

History of RCM & CBM at NAVSEA


Nowlan & Heap Reliability Centered Maintenance 1978
Integrated Condition Assessment System (ICAS) 1995
DODI 4151.22 CBM 2007
NAVSEA RCM & CBM INSTRUCTION 2009
MIL-STD-3034 2011
NAVSEA MIL-P-24534A 1985
SMARTSH IP RCM AND FLEETMER 1996
OPNAV CBM POLICY 2007
DOD RCM MANUAL 4151.22M 2011

RCM and CBM began with the Airline Industry in the 1970s and was adopted by NAVSEA soon after. CBM underpins today's Navy ship maintenance policy.

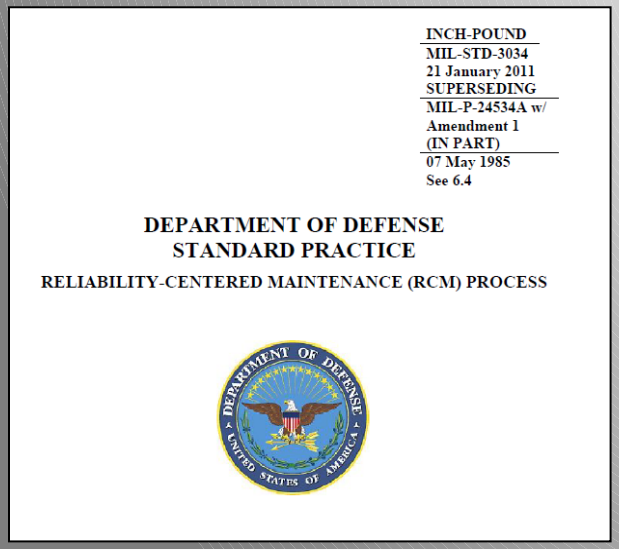
RCM is Our Policy

- DoDI 4151.22, Condition Based Maintenance Plus (CBM+) of 2 Dec. 2007 states…
  - "CBM+ is maintenance performed on evidence of need provided by ***reliability centered maintenance (RCM)*** analysis and other enabling processes and technologies…"
- OPNAVINST 4790.16A (CBM Policy) "At the core of Navy maintenance, Reliability-Centered Maintenance (RCM), defined in OPNAV 4700.7 provides the principles and rigorous methodology needed to select the appropriate type of maintenance"
- NAVSEAINST 4790.8B - Requires RCM analysis for ALL maintenance development & requires RCM Certification for all maintenance developers.
- NAVSEAINST 4790.22 CBM & RCM Policy - Delineates RCM roles and responsibilities throughout NAVSEA.

NAVSEA RCM Tools
MIL-STD 3034
"Reliability Centered Maintenance Process"

- Released in January 2011
- Navy standard, but available to all services
- 12 Phase fully detailed RCM process
- Associated Data Item Descriptions (DIDs)

Phase



INCH-POUND
MIL-STD-3034
21 January 2011
SUPERSEDING
MIL-P-24534A w/
Amendment 1
(IN PART)
07 May 1985
See 6.4

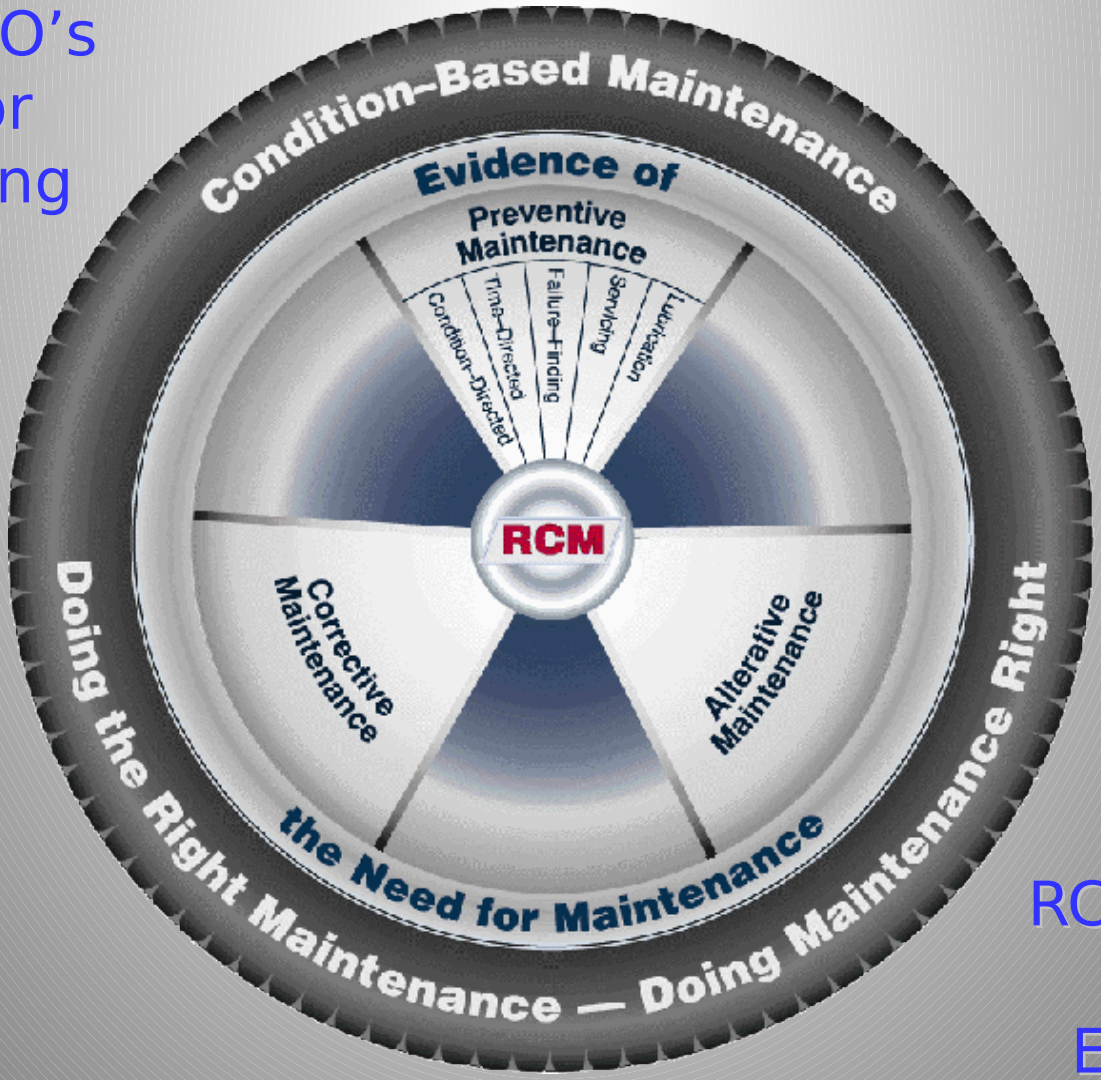
DEPARTMENT OF DEFENSE
STANDARD PRACTICE

RELIABILITY-CENTERED MAINTENANCE (RCM) PROCESS

https://assist.daps.dla.mil

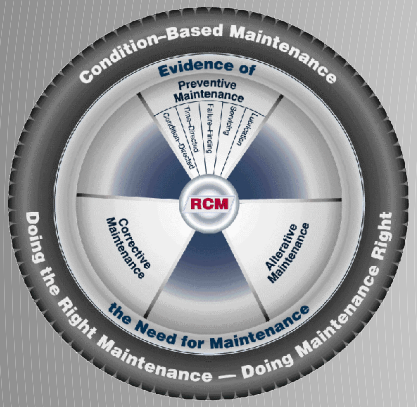
RCM Is the Hub of CBM

CBM is CNO's policy for maintaining ships.



RCM provides "Rules of Evidence."

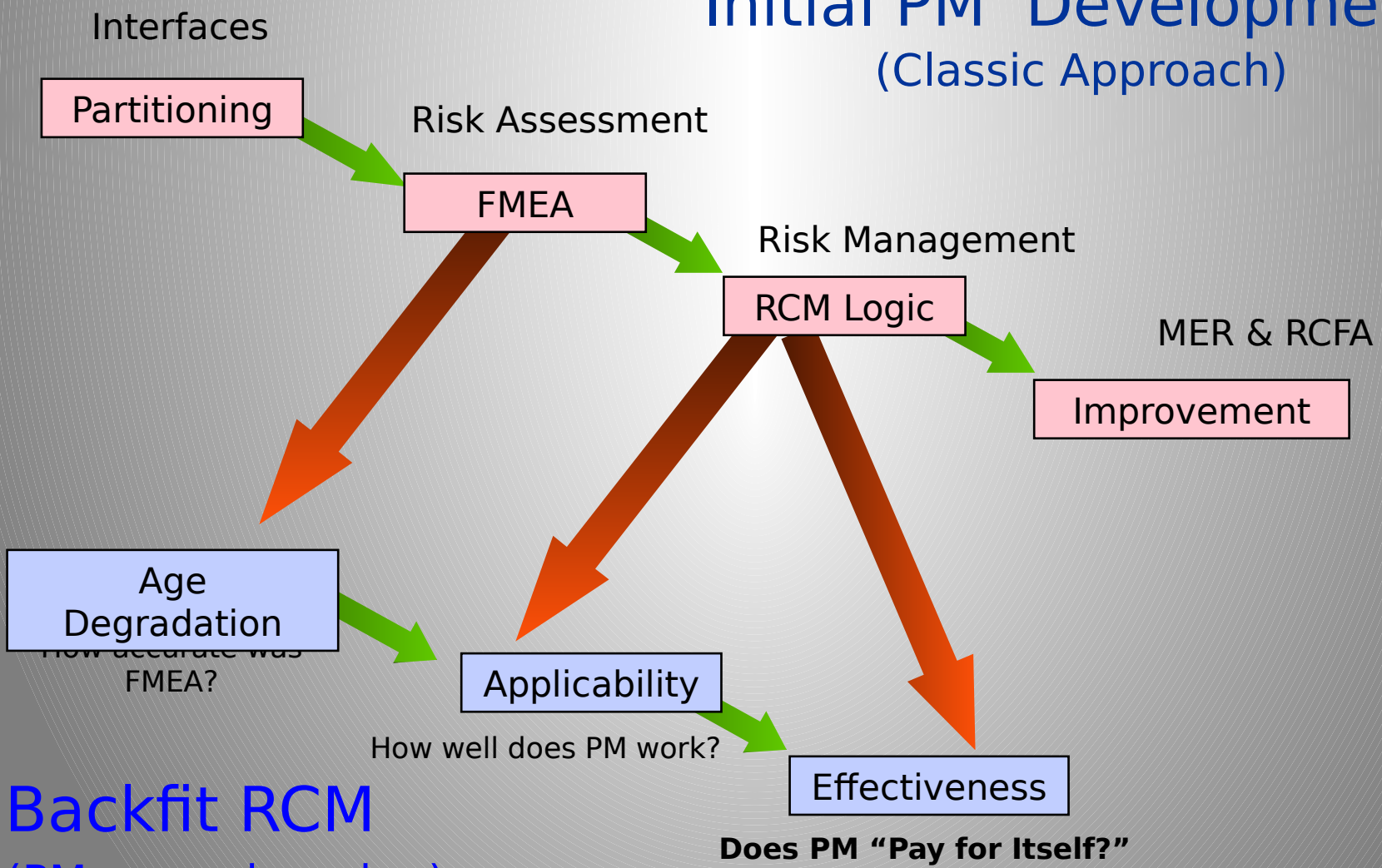
RCM's Role in CBM+



- **CBM is the foundation for your maintenance program**
- **RCM provides the means to establish CBM**
  - **All <u>RCM derived</u> PM tasks are scheduled**
    - **By calendar**
    - **Visual inspection**
    - **Predictive maintenance technology**
      - **Vibration monitoring**
      - **Wireless sensors**
      - **Oil Analysis**
      - **Infrared technology**
      - **Acoustic Technology**
      - **Others**

Two RCM Processes

Initial PM Development
(Classic Approach)



Backfit RCM
(PM re-engineering)

FLEET Maintenance Effectiveness Review - FLEETMER

Objectives

- RCM-based review for all Planned Maintenance actions (O, I, & D)
- Institutionalize execution of RCM maintenance engineering
- Standardization of Assessment processes across similar systems (where possible) and between all assessment agencies
- Standardization of Maintenance Processes across all platform types (Surface, Carrier, Submarine)

Payoff

- “Right-size” the maintenance volume
- Ensure platforms reach expected operating life
- Develop forecasts for long-range maintenance budgeting.

RCM Certification at NAVSEA

- *RCM Training & Certification Program*
  - **Level I** – Basic fundamentals and "Backfit RCM" process
    - Two day course of instruction – "Intro to RCM"
  - **Level II** – "Classic RCM"
    - One week course of instruction
    - How to develop maintenance requirements
  - **Level III** – Train the trainer
    - Government only
    - Two week course of instruction
    - Level I and Level II plus experience

RCM - A consistent, repeatable, auditable process for maintenance development

RCM Certification at NAVSEA

- *RCM Training & Certification Program*
  - Certifications are valid for three years
  - Classes taught approximately once per month (L2) and once per quarter (L1)
  - Training team can travel offsite from Fairfax, VA
  - Recertification available online via ePMS Gateway
- *DAU RCM Training*
  - Fundamentals of RCM (2 hour course)
  - DAU Continuous Learning Module CLL-030 (www.dau.mil)

NAVSEA RCM Summary

People

- RCM Certification & Training Program
  - Classic RCM Course (Level II)
  - RCM Intro/Backfit Course (Level I)
  - Three Year Certification
  - Recertification available online
  - Available to all Services & Government agencies

Policy

- NAVSEAINST 4790.8B
  - Requires RCM Certification for Maintenance Developers
  - Requires RCM for maintenance development
- NAVSEAINST 4790.27
  - Delineates CBM & RCM Policy at NAVSEA

Process

- MIL-STD 3034 RCM
  - Step by step RCM Process
  - Associated DIDs for contracting
  - Available for all Services use
- NAVSEA RCM Manual
  - Describes fundamentals of Level 1 and Level 2 RCM

Payoff

- >40 % Average maintenance manhour reduction since Backfit RCM enacted in 1997
- Since 2001, over 6000 RCM Certified
- Best Manufacturing Practices Center of Excellence award 2009
- RCM being used for new Ohio Class submarine replacement program and DDG-1000

QUESTIONS